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In re Application of: Sean Boerner

Group Art Unit: 3628

Serial No: 09/815,360

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Examiner: Nguyen, Nga B

For: Method and System to Identify Discrete Trends in Time Series

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Commissioner of Patents and Trademarks
P.O. Box 1450
Arlington, VA 22313-1450

BRIEF OF APPELLANT

This is an appeal from the final rejection of all claims of the Examiner dated February 28, 2005 rejecting claims 1-26, all of the pending claims in the case. The Brief is accompanied by the requisite fee of $250 as set forth in §41.20(b)(2).

REAL PARTY IN INTEREST

This patent application is not assigned, and Applicant remains the real party in interest.

RELATED APPEALS AND INTERFERRENCES

There are no related U.S. appeals, interferences, or judicial proceedings.

STATUS OF CLAIMS

The application was filed on March 22, 2001 as a new utility application with (26) twenty-six claims, of which (2) two were independent claims. (Claims 1 and 26).

All of the pending claims were rejected in a First Office Action dated July 5, 2005. Claims 1-26 were rejected under section §103 based on Matsuoka (U.S. Patent No. 5,956,702.

On October 5, 2005, in response to the First Office Action, Applicant amended claims 1-25 to be method claims, and corrected a clerical error in claim 26.

In the next and Final Office Action, the Examiner rejected all pending claims on February 28, 2006.

The status of the claims as set out in the Final Office action was and is as follows:

allowed claims: none

claims objected to: none

Claims rejected: 1-26

STATUS OF AMENDMENTS

On October 5, 2005 Applicant submitted amendments to claims 1-1-25 to be method claims, and corrected a clerical error in claim 26. No other amendments have been proposed or entered.

SUMMARY OF CLAIMED SUBJECT MATTER

Overview

The current invention relates to trend analysis. The method of the current invention is applied to a single series of numbers that have been constantly sampled in time or space to determine when trends end, and whether a data point represents a continuation of a previous trend. The method is not limited to a time series of stock market data. For example, the method can be applied to finding geologic sequences from well logs, because those sequences have sharp geologic boundaries. The sequences can be approximated with trend lines that have a start and end.

Claims References

The following annotated claims indicate figure and reference numbers and/or specification discussion of the claims elements [page:line(s) format]. The claims themselves are generally self-explanatory unless otherwise noted.

1. (Previously Amended) computer implemented method for breaking a time series into a plurality of discontinuous trends, the method comprising:

inputting time series data, the time series comprising a plurality of data elements, at least a portion of which represents a trend which is generally increasing or decreasing (FIG. 2, #110 ; 8:10-21);

selecting a plurality of sets of trend determination parameters (FIG. 1, #300 ; 13:15 to 15:3);

selecting a useful group of sets of trend determination parameters for the time series from the plurality of sets of trend determination parameters, such that the useful group of sets includes at least one member (11:4-11 ; 27:20-23);

processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member (FIG. 1, #400 ; FIG. 4a, 4b; 15:5 to 24:5; 28:1 to 32:16); and

outputing the trends and trend attributes (FIG. 1, #600 ; 21:7).

2. (Previously Amended) The method of claim 1 further comprising

deciding, based on the composite results of a plurality of the members of the useful group of sets of trend determination parameters, whether the newest data element of the time series represents a continuation of a trend, such that the trend is increasing, decreasing, or flat (15:10-11).

3. (Previously Amended) The method of claim 1 wherein inputting time series data further comprises

inputting a plurality of time series data sets to a computer (9:2); and

selecting a particular time series from a plurality of time series data sets (9:5).

4. (Previously Amended) The method of claim 1 wherein inputting time series data further comprises

inputting a plurality of vector datasets to a compute (25:13-14); and

selecting a particular vector data set from a plurality of time series data sets (25:17-18).

5. (Previously Amended) The method of claim 3 wherein selecting a particular time series from a plurality of time series data sets further comprises

for each of the plurality of time series data sets:

selecting at least a portion of the elements in the data set to create a selected data subset (9:6);

normalizing the selected data subset to generate a normalized subset for the time series (9:6);

storing the normalized subset on the computer;

calculating, on a processor, the slope of a best-fit polynomial regression through the normalized subset (9:15-16); and

selecting a particular time series that has a large absolute slope and a large correlation coefficient between the trend and the data elements (10:2-3).

6. (Previously Amended) The method of claim 1 further comprising

specifying a range of values for each of a plurality of trend determination parameters; and

generating the sets of trend determination parameters by selecting unique combinations of trend determination parameter values, such that the values are within the range of values for each of the plurality of trend determination parameters. (11:12-19)

7. (Previously Amended) The method of claim 6 wherein specifying a range of values for each of a plurality of trend determination parameters further comprises

specifying a minimum value for a first trend determination parameter of initial data window size;

specifying a maximum value for a first trend determination parameter of initial data window size;

specifying a minimum value for a second trend determination parameter of deviation limit; and

specifying a maximum value for a second trend determination parameter of deviation limit. (11:12-19)

8. (Previously Amended) The method of claim 1 further comprising

specifying a range of potential values for each of a plurality of trend determination parameters;

creating an objective function from at least one indications of trend results, such that the objective function generates a resultant value for a set of trend determination parameters; and

selecting a useful group of sets of trend determination parameters by applying an optimization procedure to the objective function and the range of potential values for each of the plurality of trend determination parameters. (42:9 to 43:6)

9. (Previously Amended) The method of claim 1 wherein selecting a useful group of sets of trend determination parameters for the time series from the plurality of sets of time series parameters further comprises

for each trend determination parameter set:

applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter;

identifying the dynamic trend and at least one dynamic trend attribute parameter.

calculating at least one indication of trend results between the time series and the trend set; and storing at least one indication of trend results on the computer; and

selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets. (13:15 to 15:2)

10. (Previously Amended) The method of claim 9 wherein applying the trend determination parameters to at least a portion of the time series data elements thereby generating at least one trend and at least one trend attribute parameter further comprises

assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements;

identifying the first trend as the current trend;

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not continuation of the current trend, and identifying the new trend as the current trend; and

determining at least one trend attribute for each trend. (15:4 to 22:14)

11. (Previously Amended) The method of claim 9 wherein calculating at least one indication of trend results between the time series and trend set further comprises

calculating at least one measure from the group consisting of: the number of trends in the subset of the time series, the RMS Error between the input data values and trend values, the average trend length; the average trend length divided by the minimum number of data points needed to define a trend (window size parameter), the average percent return of the trends, the summed cumulative percent return of the trends; the fraction of correct predictions, the fraction of incorrect predictions, the quotient of the root mean square error and the average length of the trends divided by the minimum number of data points needed to define a trend, and the RMS error*L_s the efficiency of the trends, where efficiency is defined as the average return of the trends divided by the average length of the trends, and compounded return of the trends. (22:15 to 23:14)

12. (Previously Amended) The method of claim 9 wherein selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and its associated trend results, where a first axis represents a first measure of trend results and a second axis represents a second measure of trend results; and (13:21-23)

selecting from the graph at least one data point that represents a trend determination parameters set that has desirable trend results.

13. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the product of the root mean square error and the deviation limit for the set of trend determination parameters, and the x-axis represents the average trend length for the set of trend determination parameters; and (13:21-23)

selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the product of the root mean square error and the deviation limit for a given average trend length . (14:5-6; FIG 6)

14. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the root mean square error for the set of trend determination parameters, and x-axis represents the average trend length for the set of trend determination parameters; and (13:21-23)

selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the root mean square error for a given average trend length. (14:5-6)

15. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one

data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and x-axis represents the average percent return for the set of trend determination parameters; and (13:9-10)

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the average percent return.

16. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and x-axis represents the fraction of correct predictions for the set of trend determination parameters; and (13:1-3)

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the fraction of correct predictions.

17. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return of the trends for the set of trend determination parameters, and x-axis represents the fraction of correct predictions for the set of trend determination parameters; and (12:22 ; 13:1-3)

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the average percent return and the fraction of correct predictions.

18. (Previously Amended)The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return for the trends for the set of trend determination parameters, and x-axis represents the average trend length for the set of trend determination parameters; and (12:21)

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for the average percent return for a given average trend length.

19. (Previously Amended) The method of claim 9 wherein selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets further comprises

specifying an objective function that incorporates at least one measure of trend results, such that minimization of the objective function produces desirable trend results; applying an optimization technique to the objective function such that the optimization technique minimizes the objective function; and

selecting at least one set of trend determination parameters as a result of minimizing the objective function. (47:9 to 43:6)

20. (Previously Amended)The method of claim 1 wherein processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member further comprises

for each member applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter; and (32:6-16)

identifying the dynamic trend and at least one dynamic trend attribute parameter; and

storing at least one dynamic trend attribute parameter on the computer.

21. (Previously Amended) The method of claim 20 wherein applying the trend determination parameters to at least a portion of the time series data elements thereby generating at least one trend and at least one trend attribute parameter further comprises

assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements;

identifying the first trend as the current trend;

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not continuation of the current trend, and identifying the new trend as the current trend; and

determining at least one trend attribute for each trend. (32:6-16)

22. (Previously Amended) The method of claim 21 wherein generating a first trend with at least a portion of the data elements further comprises

recalling the first trend determination parameter, the data window size, from the set of trend determination parameters; forming a proposed trend data set by selecting a number of data elements from the time series, such that the number of

data elements selected is at least as large as the value of the data window size trend determination parameter;

calculating a first best-fit curve through the proposed trend data set; and

identifying the best fit curve as the first trend. (15:10-15)

23. (Previously Amended) The method of claim 21 wherein evaluating each subsequent data element to determine whether the data element is a continuation of the current trend further comprises

forming a proposed trend data set from the selected data elements; calculating a new best-fit curve through the proposed trend data set; calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed trend data set; projecting the best-fit curve to the location of the subsequent data element; (15:10-15)

evaluating the deviation of the subsequent data element from the projected best-fit curve value at the new location; and

applying at least one acceptance criteria to the measure of predictive error, and if the acceptance criteria is met setting the subsequent data element to the proposed trend data set, identifying the new best-fit curve as the current trend, and if the acceptance criteria is not met setting the subsequent data element to a new trend set, determining a new trend, and identifying the new trend as the current trend.

24. (Previously Amended) The method of claim 23 wherein calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed data set further comprises

evaluating the derivative of the best-fit curve;

obtaining an estimated value of the best-fit curve at the new element; calculating the residuals between the proposed trend data set and the new best-fit curve; normalizing the residuals; quantifying the spread of the distribution of the normalized residuals; (15:10-15)

calculating the deviation of predicted trend value at the new element from the actual value of the new element; and

normalizing the deviation of predicted trend value at the new element from the actual value of the new element using the spread of the distribution of normalized residuals.

25. (Previously Amended) The method of claim 23 wherein applying at least one acceptance criteria to the measure of predictive error further comprises

designating a first test criterion as true if the sign of the derivative of the trend curve generated through the proposed trend dataset changes compared to the sign of the derivative of the trend curve generated previously; (47:14-15)

designating a second test criterion as true if the absolute value of normalized deviation exceeds the deviation limit parameter;

designating a third test criterion as true if the absolute value of normalized deviation exceeds the deviation limit parameter and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset;

designating a fourth test criterion as true if the correlation coefficient between the proposed trend curve and the proposed trend dataset decreases below the correlation limit parameter;

designating a fifth test criterion as true if the number of times that the absolute value of normalized deviation exceeds the deviation limit parameter; and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset; exceeds the number of values parameter; (47:15-16)

designating a sixth test criterion as true if the absolute value of the normalized deviation from a flat trend exceeds the flat trend deviation limit; and (49:7-10)

determining whether at least one of the first, second, third, fourth, fifth, and sixth test criteria is true.

26. (Previously Amended) A system for use in an information processing apparatus for breaking a time series into a plurality of discontinuous trends and determining if a new data element represents a continuation of the latest trend the system comprising:

input means for inputting time series data, the time series comprising a plurality of data elements; processing means for generating a plurality of sets of trend determination parameters for the time series by specifying a range of values for each of a plurality of trend determination parameters, and generating the sets of trend determination parameters by selecting unique combinations of trend determination parameter values, such that the values are within the range of values for each of the plurality of trend determination parameters; selecting a useful group of sets from the plurality of sets of trend determination parameters for the time series, such that the useful group of sets includes at least one member by, for each trend determination parameter set:

applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter,

identifying the dynamic trend and at least one dynamic trend attribute parameter,

calculating at least one indication of trend results between the time series and the trend set, and

storing at least one indication of trend results on the computer, selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets; (8:10 to 13:13)

processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member by applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter, assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements; identifying the first trend as the current trend; (15:5 to 22:13)

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to

a new trend if it is not a continuation of the current trend, and identifying the new trend as the current trend;

determining at least one trend attribute for each trend, and identifying the dynamic trend and at least one dynamic trend attribute parameter;

evaluating at least one new data element for the time series by determining for each member whether the new data element represents a continuation of a dynamic trend; and

deciding, based on the composite results of the members, whether the data element represents a continuation of a dynamic trend; and

output means for outputting the trends for each member.

GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL

1. The Examiner has rejected all claims 1-26 as being anticipated by Rebane U.S. Patent No. 6,078,904.

ARGUMENT

2. Rebane does not describe or use trend analysis.

Rebane describes a system for allocating money to various investments based on their historical performance over a past period of time, the investor's tolerance for risk, and the investor's net worth. The goal is to come up with the fractional amounts of money that will be put into each of the investments if any. Rebane does not use trends in his analysis, nor does he use any type of trend analysis. The historical performance is accounted for by the use of a few statistical measures, but there is nothing in Rebane that suggests calculating trends or using them in his method.

The current invention relates to trend analysis. The method of the current invention is applied to a single series of numbers that have been constantly sampled in time or space to determine when trends end. The method is not limited to a time series of stock market data. For example, the method can be applied to finding geologic sequences from well logs, because those sequences have sharp geologic boundaries. The sequences can be approximated with trend lines that have a start and end.

3. As described below in the claims discussion, Rebane does not anticipate the claims of the current invention. A closer inspection of Rebane shows that it does not include any element of the claims of the current invention.

Claim 1

4. Rebane does not teach "...inputting time series data, the time series comprising a plurality of data elements, at least a portion of which represents a trend which is generally increasing or decreasing" as claimed in claim 1.

The Examiner cites Rebane (col 12, line 60 – col 13, line 27) as a precedent for inputting time series data. This section describes the investor inputting into the program a "scenario of financial factors that will be used to define the optimization requirements". This input includes the following values:

- The "representative epoch" or time period for the securities and market
- The portfolio of investments to be considered
- The market prediction data, including "Investment Horizon, Market Appreciation, and Standard Deviation data".
- More data on securities if they are already known, including the loads, whether the stocks are owned or not, whether money has been loaned to purchase the stocks, portfolio management fees, tax rates, purchase costs, and statistical measures, such as alfas (sic), betas, sigmas, and correlation coefficients.

There is nothing in this description of dealing with a time series for trend analysis.

At (Col 13, line 27), Rebane is describing the method of optimizing the allocation of investment assets. This has nothing to do with finding trends in a time series. Rebane is determining how much money to allocate to a short list of investments.

5. Rebane does not teach "selecting a plurality of sets of trend determination parameters" as claimed in claim 1.

The Examiner cites Rebane (col 11, line 45 – col 12, line 20) as a precedent for selecting a plurality of sets of trend determination parameters. This section describes the variables that will be stored by Rebane's program.

- Current risk tolerance function (RTF)
- Current Short List Nominations – this is the short list of investments for portfolio optimization
- Current Short List Performance – this is the performance of the assets in the short list. It is the predicted performance of these investments "including a covariance matrix of market performance data".
- Current Actual Portfolio
- Current Allocation Constraints
- Current Market Prediction relative to an index, such as the SP 500 or Dow Jones Industrial Average.
- Investment Horizon - Length of time for the investment)
- Market Appreciation – "the estimate of annualized return during the Investment Horizon"
- Standard Deviation – "the standard deviation of market returns".
- Current Rates
- Current Computed Portfolio and other variables.

Nothing in this list has anything to do with trend analysis or picking the parameters for determining trends.

6. Rebane does not teach "selecting a useful group of sets of trend determination parameters for the time series from the plurality of sets of trend determination parameters, such that the useful group of sets includes at least one member" as claimed in claim 1.

   The Examiner cites Rebane (col 11, line 45 – col 12, line 20) as a precedent for selecting a plurality of sets of trend determination parameters. This section was previously referenced. Nothing in this section has anything to do with trend analysis or picking the parameters for determining trends.

7. Rebane does not teach "processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member" as claimed in claim 1.

   The Examiner cites Rebane (col 11, line 45 – col 12, line 20) as a precedent for processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member. This section was previously referenced. Nothing in this section has anything to do with processing a time series to generate a set of trends or trend attributes.

8. Rebane does not teach "outputting the trends and trend attributes" as claimed in claim 1.

The Examiner cites Rebane (col 13, line 45 – col 14, line 8) as a precedent for outputting the trends and trend attributes. In this section, Rebane describes the process that the investor can then review the results and modify any of the input factors used to control the portfolio optimization. The portfolio can then be re-optimized based on the changes that the investor has made.

This refers to the process of reviewing the results of a previous *portfolio* optimization and changing some of the input variables. There is nothing in this section related to outputting trends or trend attributes.

9. As discussed above, Rebane does not teach any of the elements of claim 1 of the current invention.

Claim 2

10. Rebane does not teach "deciding, based on the composite results of a plurality of the members of the useful group of sets of trend determination parameters, whether the newest data element of the time series represents a continuation of a trend such that the trend is increasing, decreasing or flat" as claimed in claim 2.

The Examiner cites Rebane (col 14, lines 4-8) as a precedent for deciding, based on the composite results of a plurality of the members of the useful group of sets of trend determination parameters, whether the newest data element of the time series represents a continuation of a trend such that the trend is increasing, decreasing or flat. This section describes

- Editing the securities' predicted performance parameters; and
- after editing, commanding recomputation or reoptimization of the portfolio to produce a revised computed portfolio which itself may be further edited or discarded or labeled and stored.

Rebane refers to the optimization of a portfolio, which has nothing to do with trends or trend determination parameters. Rebane is optimizing the amounts of money that will be allocated among various investments in a portfolio. It is a single application of optimization of which there are myriad problems in which optimization is used to determine the best parameters for a particular application. However, this section in Rebane's patent has nothing to do with trends, trend determination parameters, or determining whether the newest member of a time series is a member of the trend.

Claim 3

11. Rebane does not teach "inputting time series data further comprises inputting a plurality of time series data sets to a computer; and selecting a particular time series from a plurality of time series data sets" as claimed in claim 3.

The Examiner cites Rebane (col 12, line 60 – col 13, line 27) as a precedent for inputting time series data further comprises inputting a plurality of time series data sets to a computer; and selecting a particular time series from a plurality of time series data sets. This section describes the process of specifying "a scenario of financial factors that will be used to define the optimization requirements". Rebane describes the variables that are input, such as:

- The representative epoch for the securities (and market), which is the time period for computing the optimum investment allocation
- Editing the actual portfolio. This includes the names of the securities and the relevant information about each security, including the purchase price, purchase data, and current price.
- Current market prediction data. This includes "the Investment Horizon, Market Appreciation, and Standard Deviation data. " These variables have been defined previously and also within Rebane's patent.
- Current loads and fees on securities and what resources are to be used for their purchase. In other words, should the security be purchased with borrowed

money? For stocks, this will also includes a number of statistical measures, none of which involve trends.

- Finally, the investor labels the scenario for storage and later retrieval.

None of these items specifically refer to "inputting a plurality of time series data sets to a computer; and selecting a particular time series from a plurality of time series data sets".

Claim 4

12. Rebane does not teach "inputting a plurality of vector datasets to a computer; and selecting a particular vector dataset from a plurality of time series data sets" as claimed in claim 4.

The Examiner cites Rebane (col 17, lines 10-45) as a precedent for inputting a plurality of vector datasets to a computer; and selecting a particular vector dataset from a plurality of time series data sets. This section describes the calculation and display of the standard correlation matrix between different securities.

In the current invention, there is no need to calculate the correlation matrix as part of trend analysis, because the trends are not dependent upon the correlation between any other time series.

Claim 5

13. Rebane does not teach "selecting at least a portion of the elements in the data set to create a selected data subset; normalizing the selected data subset to generate a normalized subset for the time series; storing the normalized subset on the computer; calculating, on a processor, the slope of a best-fit polynomial regression through the normalized subset; and selecting a particular time series that has a large absolute

slope and a large correlation coefficient between the trend and the data elements" as claimed in claim 5.

The Examiner cites Rebane (col 15, lines 20-55) as a precedent for these claim elements. This section describes the procedure where the investor interactively adjusts the amounts that are to be invested in each security or investment and the return and confidence intervals on the portfolio are recomputed. The purpose is to examine the sensitivity of the portfolio to investment allocation.

This has nothing to do with selecting a time series subset; normalizing the subset; storing the normalized subset on the computer; calculating, on a processor, the slope of a best-fit polynomial regression through the normalized subset; and selecting a particular time series that has a large absolute slope and a large correlation coefficient between the trend and the data elements. Trend analysis has nothing to do with the allocation of capital into multiple investments.

Claim 6

14. Rebane does not teach "specifying a range of values for each of a plurality of trend determination parameters; and generating the sets of trend determination parameters by selecting unique combinations of trend determination parameter values, such that the values are within the range of values for each of the plurality of trend termination parameters" as claimed in claim 6.

The Examiner cites Rebane (col 15, lines 1-20) as a precedent for these claim elements. This section describes the use of a software tool by the investor in which the investor is manually adjusting the amounts to invest and the constraints on the minimum and maximum amounts to invest in each investment or security.

This has nothing to do with trends or selecting trend determination parameters. Calculating trends from a series of numbers that are constantly sampled in time or space may have nothing to do with investing money.

Claim 7

15. Rebane does not teach "specifying a minimum value for a first trend determination parameter of initial data window size; specifying a maximum value for a first trend determination parameter of initial data window size; specifying a minimum value for a second trend determination parameter of deviation limit; and specifying a maximum value for a second trend determination parameter of deviation limit" as claimed in claim 7.

The Examiner cites Rebane (col 15, lines 1-20) as a precedent for these claim elements. This section describes the use of a software tool by the investor in which the investor is manually adjusting the amounts to invest and the constraints on the minimum and maximum amounts to invest in each investment or security.

The current invention claims selecting the constraints on a pair of parameters that will describe the minimum and maximum lengths of the trends and the minimum and maximum standard deviation limits that can be used to define a trend. This has nothing to do with determining the minimum and maximum amounts to invest in a portfolio of securities or investments.

Claims 8, 19, 24, and 25

16. Rebane does not teach "specifying a range of potential values for each of a plurality of trend determination parameters; creating an objective function from at least one indications of trend results, such that the objective function generates a resultant value for a set of trend determination parameters; and selecting a useful group of sets of trend determination parameters by applying an optimization procedure to the

objective function and the range of potential values for each of the plurality of trend determination perimeters" as claimed in claim 8.

17. Rebane does not teach "specifying an objective function that incorporates at least one measure of trend results, such that minimization of the objective function produces desirable trend results; applying an optimization technique to the objective function such that the optimization technique minimizes the objective function and selecting at least one set of trend determination parameters as a result of minimizing the objective function " as claimed in claim 19.

18. Rebane does not teach "wherein calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed data set further comprises evaluating the derivative of the best-fit curve; obtaining an estimated value of the best-fit curve at the new element; calculating the residuals between the proposed trend data set and the new best-fit curve; normalizing the residuals; quantifying the spread of the distribution of the normalized residuals; calculating the deviation of predicted trend value at the new element from the actual value of the new element; and normalizing the deviation of predicted trend value at the new element from the actual value of the new element using the spread of the distribution of normalized residuals true " as claimed in claim 24.

19. Rebane does not teach "designating a first test criterion as true if the sign of the derivative of the trend curve generated through the proposed trend dataset changes compared to the sign of the derivative of the trend curve generated previously; designating a second test criterion as true if the absolute value of the normalized deviation exceeds the deviation limit parameter; designating a third test criterion as true of the absolute value of normalized deviation exceeds the deviation limit parameter and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset; designating a fourth test criterion as true if the correlation coefficient between the proposed trend curve and the proposed trend data set decreases below the

correlation limit parameter; designating a fifth test criterion as true if the number of times that the absolute value of normalized deviation exceeds the deviation limit parameter; and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset; exceeds the number of values parameter; designating a sixth test criterion as true if the absolute value of the normalized deviation from a flat trend exceeds the flat trend deviation limit; and determining whether at least one of the first, second ,third, fourth, fifth, and sixth test criteria is true " as claimed in claim 25.

20. The Examiner cites Rebane (cols 23-32) as a precedent for these claim elements. In these sections, Rebane describes the optimization of the portfolio among a number of securities and other investments. He describes how much is to be borrowed, etc.

There is nothing in Rebane that has anything to do with trends. Rebane does not calculate trends. Rebane does not use trends. Rebane does an optimization of a portfolio based on investor risk tolerance and assets.

The current invention relates to optimizing the parameters that generate trends. Optimization procedures are used in many applications. The optimization claimed in the current application refer to optimizing the parameters that control the trends on a series of numbers in time or space.

Claim 9

21. Rebane does not teach "applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter; identifying the dynamic trend and at least one dynamic trend attribute parameter; calculating at least one indication of trend results between the time series and the trend set; and storing at least one indication of trend results on the computer; and selecting at least one set of trend determination

parameters based on at least one indication of trend results for each of the sets" as claimed in claim 9.

The Examiner cites Rebane (col 13, line 45 – col 14, line 8) as a precedent for these claim elements. This section describes the process that the investor can then review the results of a portfolio optimization and modify any of the input factors used to control the portfolio optimization. The portfolio can then be re-optimized based on the changes that the investor has made. This section is not related to the claims of the current invention.

Claim 10, 21, 22

22. Rebane does not teach "assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements; identifying the first trend as the current trend; evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not continuation of the current trend, and identifying the new trend as the current trend; and determining at least one trend attribute for each trend" as claimed in claim 10.

23. Rebane does not teach "wherein applying the trend determination parameters to at least a portion of the time series data elements thereby generating at least one trend and at least one trend attribute parameter further comprises: assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements; identifying the first trend as the current tend (sic); evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not a continuation of the current trend, and identifying the new trend as the current

trend; and determining at least one trend attribute for each trend." as claimed in claim 21.

24. Rebane does not teach wherein generating a first trend with at least a portion of the data elements further comprises: recalling the first trend determination parameter, the data window size, from the set of trend determination parameters; forming a proposed trend data set by selecting a number of data elements from the time series, such that the number of data elements selected is at least as large as the value of the data window size trend determination parameter; calculating a first best-fit curve through the proposed trend data set; and identifying the best fit curve as the first trend." as claimed in claim 22.

25. The Examiner cites Rebane (col 13, line 45 – col 14, line 8) as a precedent for these claim elements. This section describes the process that the investor can then review the results of a portfolio optimization and modify any of the input factors used to control the portfolio optimization. The portfolio can then be re-optimized based on the changes that the investor has made. This section is not related to the claims of the current invention.

Claim 11

26. Rebane does not teach "wherein calculating at least one indication of trend results between the time series and trend set further comprises: calculating at least one measure from the group consisting of: the number of trends in the subsets of the time series, the RMS Error between the input data values and trend values, the average trend length; the average trend length divided by the minimum number of data points needed to define a trend (window size parameter), the average percent return of the trends, the summed cumulative percent return of the trends; the fraction of correct predictions, the fraction of incorrect predictions, the quotient of the root mean square error and the average length of the trends divided by the minimum number of data points needed to define a trend, and the RMS error, the efficiency of the trends, where

efficiency is defined as the average return of the trends divided by the average length of the trends, and the compounded return of the trends" as claimed in claim 11.

The Examiner cites Rebane (col 17, lines 10-47) as a precedent for these claim elements. This section describes the calculation and display of the standard correlation matrix between different securities.

There is no need to calculate the correlation matrix between time series or investments as part of trend analysis, because the trends are not dependent upon the correlation between any other time series. The statistical attributes described in claim 11 do not refer to the correlation matrix between securities- the attributes relate to calculating the correlation between the trend and the underlying time series.

Claim 12

27. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and its associated trend results, where a first axis represents a first measure of trend results and a second axis represents a second measure of trend results; and selecting from the graph at least one data point that represents a trend determination parameters set that has desirable trend results " as claimed in claim 12.

The Examiner cites Rebane Figure 9 as a precedent for these claim elements. Rebane's Figure 9 refers to the generation and comparison of financial performance of different portfolio designs or scenarios under uniform market conditions.

In the current application, Figure 6 is a crossplot that is useful for determining the optimum trend parameters. Crossplots are used in many applications, and Rebane's application and the current invention are substantially different. The current

invention crossplot refers specifically to finding and selecting parameters to be used in calculating trends. Rebane's patent has nothing to do with trends.

Claims 13, 14, 17, 18

28. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the product of the root mean square error and the deviation limit for the set of trend determination parameters, and the x-axis represents the average trend length for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the product of the root mean square error and the deviation limit for a given average trend length" as claimed in claim 13.

29. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the root mean square error for the set of trend determination parameters, and the x-axis represents the average trend length for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the root mean square error for a given average trend length" as claimed in claim 14.

30. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return of the trends for the set of trend determination parameters, and the x-axis represents the fraction of correct predictions for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the average percent return and the fraction of correct predictions" as claimed in claim 17.

31. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return of the trends for the set of trend determination parameters, and the x-axis represents the average trend length for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for the average percent return for a given average trend length" as claimed in claim 18.

32. The Examiner cites Rebane Figure 12 as a precedent for these claim elements. Rebane's Figure 12 refers to a univariate Gaussian distribution of a portfolio where maximum loss is limited to the sum of risky investments.

Rebane's Figure 12, is a univariate distribution, and is not a crossplot that is described in claim 13. While a univariate distribution can be considered to be a crossplot in a very general sense, a statistician or practitioner skilled in the art of statistics would not confuse univariate distributions with crossplots. Rebane does not teach a crossplot for finding and selecting parameters to be used in calculating trends. Rebane's patent has nothing to do with trends, calculating trends, or using them.

Claim 15

33. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and the x-axis represents the average percent return for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the average percent return" as claimed in claim 15.

The Examiner cites Rebane Figures 7 and 8 as a precedent for these claim elements. Rebane's Figures 7 and 8 refer to bar charts that show the expected return from the portfolio of investments and whereby the investor can modify the amounts invested in each of the securities and the constraints on those investments. Rebane's Figures 7 and 8 are not crossplots as claimed in Claim 15.

Claims 16 and 23

34. Rebane does not teach "plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and the x-axis represents the action of correct predictions for the set of trend determination parameters; and selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the fraction of correct predictions" as claimed in claim 16.

35. Rebane does not teach "wherein evaluating each subsequent data element to determine whether the data element is a continuation of the current trend is further comprises: forming a proposed trend data set from the selected data elements; calculating a new best-fit curve through the proposed trend data set; calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed trend data set; projecting the best-fit curve to the location of the subsequent data element; evaluating the deviation of the subsequent data element from the projected best-fit curve value at the new location; and applying at least one acceptance criteria to the measure of predictive error, and if the acceptance criteria is met setting the subsequent data element to the proposed trend data set, identifying the new best-fit curve ms (sic) the current trend, and if the acceptance criteria is not met setting the subsequent data element to a new trend set, determining a new trend, and identifying the new trend as the current trend" as claimed in claim 23.

36. The Examiner cites Rebane (col 15, lines 20-55) as a precedent for these claim elements. In this section, Rebane describes the procedure where the investor interactively adjusts the amounts that are to be invested in each security or investment and the return and confidence intervals on the portfolio are recomputed. The purpose is to examine the sensitivity of the portfolio to investment allocation. This section also refers to Figure 7 from Rebane. This section does not relate to trends or to crossplots.

Claim 20

37. Rebane does not teach "wherein processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member further comprises for each member applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter; and

identifying the dynamic trend and at least one dynamic trend attribute parameter; and storing at least one dynamic trend attribute parameter on the computer." as claimed in claim 20.

The Examiner cites Rebane (col 13, lines 25-27) as a precedent for these claim elements. "Finally, the investor labels the Financial Factors Scenario for storage and later retrieval". This section is not related to calculating and storing one or more trend attribute parameters on the computer, as claimed in claim 20.

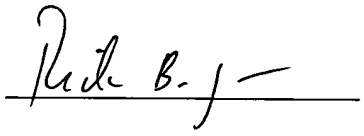
Claim 26

38. As described above, Rebane does not relate to calculating trends, and does not teach the elements of claim 26.

Applicant respectfully argues that all pending claims are in condition for allowance.

Dated: August 28, 2006

Respectfully submitted,



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/Rick B. Yeager/

Rick B. Yeager

CLAIMS APPENDIX

The following are the claims on appeal:

CLAIMS LISTING

1. (Previously Amended) computer implemented method for breaking a time series into a plurality of discontinuous trends, the method comprising:

inputting time series data, the time series comprising a plurality of data elements, at least a portion of which represents a trend which is generally increasing or decreasing;

selecting a plurality of sets of trend determination parameters;

selecting a useful group of sets of trend determination parameters for the time series from the plurality of sets of trend determination parameters, such that the useful group of sets includes at least one member;

processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member; and

outputing the trends and trend attributes.

2. (Previously Amended) The method of claim 1 further comprising

deciding, based on the composite results of a plurality of the members of the useful group of sets of trend determination parameters, whether the newest data element of the time series represents a continuation of a trend, such that the trend is increasing, decreasing, or flat.

3. (Previously Amended) The method of claim 1 wherein inputting time series data further comprises

inputting a plurality of time series data sets to a computer; and

selecting a particular time series from a plurality of time series data sets.

4. (Previously Amended) The method of claim 1 wherein inputting time series data further comprises

inputting a plurality of vector datasets to a computer; and

selecting a particular vector data set from a plurality of time series data sets.

5. (Previously Amended) The method of claim 3 wherein selecting a particular time series from a plurality of time series data sets further comprises

for each of the plurality of time series data sets:

selecting at least a portion of the elements in the data set to create a selected data subset;

normalizing the selected data subset to generate a normalized subset for the time series;

storing the normalized subset on the computer;

calculating, on a processor, the slope of a best-fit polynomial regression through the normalized subset; and

selecting a particular time series that has a large absolute slope and a large correlation coefficient between the trend and the data elements.

6. (Previously Amended) The method of claim 1 further comprising

specifying a range of values for each of a plurality of trend determination parameters; and

generating the sets of trend determination parameters by selecting unique combinations of trend determination parameter values, such that the values are within the range of values for each of the plurality of trend determination parameters.

7. (Previously Amended) The method of claim 6 wherein specifying a range of values for each of a plurality of trend determination parameters further comprises

specifying a minimum value for a first trend determination parameter of initial data window size;

specifying a maximum value for a first trend determination parameter of initial data window size;

specifying a minimum value for a second trend determination parameter of deviation limit; and

specifying a maximum value for a second trend determination parameter of deviation limit.

8. (Previously Amended) The method of claim 1 further comprising

specifying a range of potential values for each of a plurality of trend determination parameters;

creating an objective function from at least one indications of trend results, such that the objective function generates a resultant value for a set of trend determination parameters; and

selecting a useful group of sets of trend determination parameters by applying an optimization procedure to the objective function and the range of potential values for each of the plurality of trend determination parameters.

9. (Previously Amended) The method of claim 1 wherein selecting a useful group of sets of trend determination parameters for the time series from the plurality of sets of time series parameters further comprises

for each trend determination parameter set:

applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter;

identifying the dynamic trend and at least one dynamic trend attribute parameter.

calculating at least one indication of trend results between the time series and the trend set; and storing at least one indication of trend results on the computer; and

selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets.

10. (Previously Amended) The method of claim 9 wherein applying the trend

determination parameters to at least a portion of the time series data elements thereby generating at least one trend and at least one trend attribute parameter further comprises

assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements;

identifying the first trend as the current trend;

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not continuation of the current trend, and identifying the new trend as the current trend; and

determining at least one trend attribute for each trend.

11. (Previously Amended) The method of claim 9 wherein calculating at least one indication of trend results between the time series and trend set further comprises

calculating at least one measure from the group consisting of: the number of trends in the subset of the time series, the RMS Error between the input data values and trend values, the average trend length; the average trend length divided by the minimum number of data points needed to define a trend (window size parameter), the average percent return of the trends, the summed cumulative percent return of the trends; the fraction of correct predictions, the fraction of incorrect predictions, the quotient of the root mean square error and the average length of the trends divided by the minimum number of data points needed to define a trend, and the RMS error*L_s the efficiency of the trends, where efficiency is defined as the average return of the trends divided by the average length of the trends, and compounded return of the trends.

12. (Previously Amended) The method of claim 9 wherein selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and its associated trend results, where a first axis

represents a first measure of trend results and a second axis represents a second measure of trend results; and

selecting from the graph at least one data point that represents a trend determination parameters set that has desirable trend results.

13. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the product of the root mean square error and the deviation limit for the set of trend determination parameters, and the x-axis represents the average trend length for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the product of the root mean square error and the deviation limit for a given average trend length .

14. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the root mean square error for the set of trend determination parameters, and x-axis represents the average trend length for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a minimum value for the root mean square error for a

given average trend length.

15. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and x-axis represents the average percent return for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the average percent return.

16. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the summed cumulative percent return of the trends for the set of trend determination parameters, and x-axis represents the fraction of correct predictions for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the summed cumulative percent return and the fraction of correct predictions.

17. (Previously Amended) The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return of the trends for the set of trend determination parameters, and x-axis represents the fraction of correct predictions for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for both the average percent return and the fraction of correct predictions.

18. (Previously Amended)The method of claim 12 wherein plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters and their associated trend results and selecting from the graph at least one data point that represents a parameters set that has desirable trend results further comprises

plotting on a graph a representative data point for each of the plurality of sets of trend determination parameters, where the y-axis represents the average percent return for the trends for the set of trend determination parameters, and x-axis represents the average trend length for the set of trend determination parameters; and

selecting at least one set of trend determination parameters associated with a point from the graph that has a maximum value for the average percent return for a given average trend length.

19. (Previously Amended) The method of claim 9 wherein selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets further comprises

specifying an objective function that incorporates at least one measure of trend results, such that minimization of the objective function produces desirable trend results; applying an optimization technique to the objective function such that the optimization technique minimizes the objective function; and

selecting at least one set of trend determination parameters as a result of minimizing the objective function.

20. (Previously Amended)The method of claim 1 wherein processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member further comprises

for each member applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter; and

identifying the dynamic trend and at least one dynamic trend attribute parameter; and

storing at least one dynamic trend attribute parameter on the computer.

21. (Previously Amended) The method of claim 20 wherein applying the trend determination parameters to at least a portion of the time series data elements thereby generating at least one trend and at least one trend attribute parameter further comprises

assigning each of the data elements to at least one trend by generating a first trend with at least a portion of the data elements;

identifying the first trend as the current trend;

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not continuation of the current trend, and identifying the new trend as the current trend; and

determining at least one trend attribute for each trend.

22. (Previously Amended) The method of claim 21 wherein generating a first trend with at least a portion of the data elements further comprises

recalling the first trend determination parameter, the data window size, from the set of trend determination parameters; forming a proposed trend data set by selecting a number of data elements from the time series, such that the number of data elements selected is at least as large as the value of the data window size trend determination parameter;

calculating a first best-fit curve through the proposed trend data set; and

identifying the best fit curve as the first trend.

23. (Previously Amended) The method of claim 21 wherein evaluating each subsequent data element to determine whether the data element is a continuation of the current trend further comprises

forming a proposed trend data set from the selected data elements; calculating a new best-fit curve through the proposed trend data set; calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed trend data set; projecting the best-fit curve to the location of the subsequent data element;

evaluating the deviation of the subsequent data element from the projected best-fit curve value at the new location; and

applying at least one acceptance criteria to the measure of predictive error, and if the acceptance criteria is met setting the subsequent data element to the proposed trend data set, identifying the new best-fit curve as the current trend, and if the acceptance criteria is not met setting the subsequent data element to a new trend set, determining a new trend, and identifying the new trend as the current trend.

24. (Previously Amended) The method of claim 23 wherein calculating at least one measure of predictive error for the new best-fit curve with respect to the values of the data elements in the proposed data set further comprises

evaluating the derivative of the best-fit curve;

obtaining an estimated value of the best-fit curve at the new element; calculating the residuals between the proposed trend data set and the new best-fit curve; normalizing the residuals; quantifying the spread of the distribution of the normalized residuals;

calculating the deviation of predicted trend value at the new element from the actual value of the new element; and

normalizing the deviation of predicted trend value at the new element from the actual value of the new element using the spread of the distribution of normalized residuals.

25. (Previously Amended) The method of claim 23 wherein applying at least one acceptance criteria to the measure of predictive error further comprises

designating a first test criterion as true if the sign of the derivative of the trend curve generated through the proposed trend dataset changes compared to the sign of the derivative of the trend curve generated previously;

designating a second test criterion as true if the absolute value of normalized deviation exceeds the deviation limit parameter;

designating a third test criterion as true if the absolute value of normalized deviation exceeds the deviation limit parameter and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset;

designating a fourth test criterion as true if the correlation coefficient between the proposed trend curve and the proposed trend dataset decreases below the correlation limit parameter;

designating a fifth test criterion as true if the number of times that the absolute value of normalized deviation exceeds the deviation limit parameter; and the normalized deviation is in the opposite direction as the direction of the trend as designated by the derivative of the trend curve through the proposed trend dataset; exceeds the number of values parameter;

designating a sixth test criterion as true if the absolute value of the normalized deviation from a flat trend exceeds the flat trend deviation limit; and

determining whether at least one of the first, second, third, fourth, fifth, and sixth test criteria is true.

26. (Previously Amended) A system for use in an information processing apparatus for breaking a time series into a plurality of discontinuous trends and determining if a new data element represents a continuation of the latest trend the system comprising:

input means for inputting time series data, the time series comprising a plurality of data elements; processing means for generating a plurality of sets of trend determination parameters for the time series by specifying a range of values for each of a plurality of trend determination parameters, and generating the sets of trend determination parameters by selecting unique combinations of trend determination parameter values, such that the values are within the range of values for each of the plurality of trend determination parameters; selecting a useful group of sets from the plurality of sets of trend determination parameters for the time series, such that the useful group of sets includes at least one member by, for each trend determination parameter set:

applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter,

identifying the dynamic trend and at least one dynamic trend attribute parameter,

calculating at least one indication of trend results between the time series and the trend set, and

storing at least one indication of trend results on the computer, selecting at least one set of trend determination parameters based on at least one indication of trend results for each of the sets;

processing the time series with each member of the useful group of sets of trend determination parameters to generate a set of trends and trend attributes for each member by applying the trend determination parameters to at least a portion of the time series data elements, thereby generating at least one trend and at least one trend attribute parameter, assigning each of the data elements to at least one trend

by generating a first trend with at least a portion of the data elements; identifying the first trend as the current trend;

evaluating each subsequent data element to determine whether the data element is a continuation of the current trend, and assigning the data element to the current trend if it is a continuation of the current trend, and assigning the data element to a new trend if it is not a continuation of the current trend, and identifying the new trend as the current trend;

determining at least one trend attribute for each trend, and identifying the dynamic trend and at least one dynamic trend attribute parameter;

evaluating at least one new data element for the time series by determining for each member whether the new data element represents a continuation of a dynamic trend; and

deciding, based on the composite results of the members, whether the data element represents a continuation of a dynamic trend; and

output means for outputting the trends for each member.

EVIDENCE APPENDIX

RELATED PROCEEEDINGS APPENDIX